INTERNATIONAL TRADE UNDER INCONVERTIBLE PAPER

SUMMARY

I. Introductory, 360. — The purchasing-power-parity doctrine; objections to it, 361. — II. The foreign exchange markets, 364. — General method; basic assumptions, 367. — The principal media of international payment, 368. — Mechanism of the exchange market; equilibrium tendencies, 369. — The formula for media of payment; for the exchange rate, 376. — The short-run par of exchange under paper, 379. — III. The commodity markets, 383. — The relations between prices of media of payment and of commodities, 385. — The formula for exports and imports; nature of the equilibrium tendencies, 389. — Changes in the volume of commodity movements, 392. — Mechanism of the exchange and commodity markets in a specific case of disturbance, 394. — Summary of results to this point, 398. — IV. Long-run aspects, 399. — Long-run results of the specific disturbance previously examined, 400. — Relations between domestic and international prices, 404. — The business cycle, 408. — The paper par of exchange, 410. — Conclusion, 411.

I

THE outstanding difference between international trade under the gold standard and under inconvertible paper lies in the comparative instability of the foreign exchange mechanism under a paper régime. Where gold is the basis of the monetary systems in the trading countries a single fixed parity, determined by the numerical ratio between the physical weights of the units of

the various currencies, is definitely established; there is a universally acceptable medium of exchange and standard of value; and a positive mechanism develops, which tends always to prevent any very wide fluctuations of the exchange rates. Under inconvertible paper, on the other hand, there is no permanent parity, no mechanism which will necessarily and invariably correct movements of the exchanges. Large variations, both in exchange rates and in international prices, therefore become possible. Gold will of course move between countries, but only as a commodity: it cannot enter the legal tender currency, and the stabilizing effect of the gold flow mechanism is absent.

Nevertheless the general mechanisms of international trade, presumably appearing under paper, and the nature of the relationships prevailing between international trade and more purely domestic phenomena, are in many respects closely analogous to the conditions characteristic of trade under gold. The purpose of this paper is to attempt an examination of these mechanisms and relationships; an examination, it may be added, which proceeds from the view that the monetary situation presented by the existence of inconvertible paper as the basis of the monetary system is not necessarily a mere transition stage between the temporary surrender of the gold standard and an ultimate return to that standard, but may itself be a normal and permanent condition. It may also be remarked that the situation created by this abstraction of gold, while at first glance somewhat unreal, is in point of fact similar in many respects to that actually prevailing in Europe from 1914 to 1919, altho no direct investigation of this latter situation can be attempted here.

Recent discussions relevant to the problem of international trade under paper fall into three main groups.

The first includes the incidental and rather summary treatments presented in various general works on international trade or on monetary theory, and may be passed by without further notice here. Despite their many profitable suggestions and interesting points of view, no systematic treatment of the problem as a whole is attempted in any one of them.[1] The second has to do with the question of the trade between an inconvertible paper and a gold standard country; and while the resulting data and conclusions, especially those dealing with relative price movements, are important and valuable for the light they cast on our problem this group of writings, as a whole, does not concern us directly: it is occupied with a related but different question.[2] Like the first group, it may be neglected here except for incidental reference later. Finally, there remains the body of discussion centering around the purchasing-power-parity doctrine. This doctrine, and the controversy to which it has given rise, presents the only important systematic attempt that has heretofore been made to solve the problem of foreign trade under the rigid paper hypothesis, and it therefore requires somewhat more detailed attention.

The doctrine was first advanced by the Swedish economist Cassel, in the *Economic Journal* for 1916, and was elaborated by him in subsequent years. It has

1. The reader is referred especially to M. Bourguin, La Mesure de la Valeur (Paris, 1890), pp. 177 and following, for a brief but illuminating discussion of the parity of exchange under paper; and to R. G. Hawtrey, Currency and Credit (London, 1919), for a novel and suggestive approach to the general monetary aspects of international trade.

2. The problem was first considered deductively by Professor Taussig in the Quarterly Journal of Economics for May, 1917, and later by Professor Hollander. A successful attempt to verify Professor Taussig's theoretical conclusions has recently been made by Dr. Graham (F. D. Graham, International Trade of the United States, 1862–79. Unpublished Ph.D. thesis, dated 1919, now in the Harvard University Library). Graham drew much of his statistical material from W. C. Mitchell's History of the Greenbacks (Chicago, 1903). See also J. H. Williams, Argentine International Trade (Cambridge, 1920).

gained wide tho by no means unanimous support, both
in Europe and in this country. Cassel's earlier and more
tentative statement was somewhat as follows. The rate
of exchange is primarily an expression for the value, in
the money of one country, put upon the money of an-
other country.[3] Hence the rate of exchange is deter-
mined by the quotient of the general levels of prices in
the two countries; and if the quantity theory of money
be accepted, as it is by Cassel, this means that the rate is
determined by the relative quantities of the respective
circulating media. From this it follows, finally, that the
rate is "governed essentially by the degree of inflation
in the different monetary systems. All other factors,
such as the balance of trade and the confidence of the
world in this or that country, have only a quite second-
ary and temporary importance."[4] In 1918, Cassel
elaborated this idea, and declared that "the rate of
exchange is primarily determined by the purchasing
powers against goods, of the money of each country. . . .
At every moment the real parity between two countries
is represented by this quotient in the one country and
the other."[5] This parity is the "purchasing-power-
parity."

Later he qualified this view somewhat,[6] and found
that altho a permanent deviation from the parity will
arise only from a change in general price levels, tem-
porary deviations can nevertheless occur. Such devia-
tions may be due to restrictions on trade which are
greater in one direction than in the other, as from
tariffs, to distrust of the future of a given monetary
standard, to the export of capital, to the failure of ex-
port prices to reflect the general price level closely, and
so forth. But in Cassel's view these deviations will soon

3. Economic Journal, 1916, p. 62.
4. Ibid., pp. 64, 65.   5. Ibid., 1918, p. 413.
6. Annals, American Academy of Political and Social Science, May, 1920, p. 262.

be corrected, and will not affect the permanent purchasing-power-parity.

A detailed criticism of this interesting doctrine, which seems to me quite untenable, is impossible within the limits assigned to this paper. I shall simply state my objections briefly, without attempting any comprehensive proof. In the first place Cassel's qualifications, which are far more extensive now than they were in 1916, deprive the doctrine of much of its original force and novelty. Second, his rejection of the balance of trade, of loans, and of similar forces, as primary and permanent determinants of the movement of exchange rates, is hardly justifiable. Third, his neglect of money incomes — which are often themselves causes of changes in the prices of international goods, not merely dependent on such prices — is at least open to serious question. Finally, and most important of all, his reliance upon the nebulous "general price level" as the determinant of exchange rates involves an assumption true only in a static condition of trade: that the prices of international commodities and those of commodities in general move together in such close relationship that a comparison of general purchasing powers as between countries can be taken to have real significance for the purposes of international trade. But the ordinary situation is dynamic rather than static, changing rather than fixed; and the investigations of Professor Graham, Professor Williams, and others give adequate statistical support to the theoretical conclusion that in times of change international prices, as quoted in an inconvertible paper country, can and do move for many months quite without any necessarily direct and predictable relation to purely domestic prices, or to the so-called general price level.[7] Insofar as

7. A similar conclusion can legitimately be drawn, I think, from Mitchell, altho he does not go into this problem specifically. Op. cit., Part II, chap. 5, and especially pp. 272–275.

this is true, the purchasing-power-parity doctrine, which is essentially dependent on the indiscriminate jumbling-together of international and domestic prices into a composite general price level, cannot be regarded as valid during periods of transition. Domestic and international price levels, under dynamic conditions, obviously do not and cannot move in harmony, nor can the general price level accurately reflect either. Indeed, to anticipate some of the conclusions of the later discussion, exchange rates and the parity are under paper proximately determined, not by general purchasing powers or general price levels at all, but by the prices and quantities of media of international payment: the influence of purely domestic commodity prices is distinctly secondary. Furthermore, important changes may take place in domestic prices (and possibly in international prices also) without necessarily affecting the exchange rates, but all such changes will of course be reflected in the general price level, and will therefore alter the purchasing-power-parity. The latter hence fails to give a true picture of the international situation under dynamic conditions, and becomes merely misleading.

II

It therefore seems to me that a somewhat different method of attack on the general problem of international trade under inconvertible paper is necessary. The method proposed, which is presented in the following pages, centers around an attempt to examine the nature and the operation of the specific mechanisms actually or presumably involved. It lays no claims to completeness, and the conclusions drawn from it are to be regarded not as statements of proved or even of probable fact, but rather as suggestions for the guidance of further and

more definitive investigations. Nor has any statistical verification of the particular views here advanced been attempted: I have had neither the time nor the data for an inductive study.[8] I shall begin by setting up certain assumptions, designed to remove unnecessary complexities from the analysis. They are, first, the abstraction of gold in conformity with the rigid paper hypothesis; second, trade between only two countries, A and B, with no others affecting their relations; third, fixed quantities of paper currency in each country; and fourth, fairly complete competition in and between the two countries. The qualifications which these assumptions will make logically necessary in the conclusions of the later discussion are fairly obvious, and for the sake of brevity no systematic attempt will be made to remind the reader of them at each step. They do not of themselves impair the validity of the results obtained, altho they may admittedly obscure or delay the appearance of those results.

To these assumptions must be added the further statement that the whole field of the so-called "invisible items" is deliberately avoided here as far as possible, either by the method of isolation of effects or by assigning them a negative and dependent rôle: our primary concern is with the commodity field. While the argument will necessarily lose something of the appearance of reality by this abstraction, it gains in simplicity, and it does not seem to me that its substantive results are materially altered. If one country has a balance to pay to another it may make part of its payments in the form of invisible items as distinct from commodities, but this fact, while it may either exaggerate or diminish the amount of the change in the commodity situation, will

---

8. Extant statistics on the movements of war prices, for example, are as yet incomplete, and they do not make such a separation of the various kinds of prices as is essential to a study of the type here outlined.

not alter its qualitative character. The dominant and determinant factor in international trade, unless it be in the case of new countries financing their economic development abroad, will of necessity continue to be commodity transactions. And even where international borrowings are the controlling influence, such borrowings are from the point of view of international trade resolvable into two processes, one of lending and one of repayment, both of which will in the absence of gold be conducted primarily in terms of goods. Finally, the major part of the transactions in the invisible items field will at some stage in their life history enter the foreign exchange market, and their *proximate* effect there will be substantially the same, for the purposes of the later analysis, as that of commodities. The lack of any attempt here to examine the mechanism of international borrowing is therefore justifiable.

The discussion presented in the following pages may be divided into three principal sections: first, an analysis of the proximate mechanisms and tendencies governing the foreign exchange market in the "short-time" period; second, an examination of the nature of the immediate relationships between international commodity prices and movements, and the exchange rates, in the "transitional" period; and third, a somewhat more cursory investigation of certain long-run aspects of the general problem. It is proposed to proceed primarily by the method of isolation; to make the foreign exchange market the starting point, and to trace the probable subsequent effects of an important disturbance in that market were the effects of other and later disturbances to be ignored. From this point of view the division into time periods just suggested is not as arbitrary as it may at first seem, for it is obviously permissible to separate the events in the life history of a single given disturbance into two or more phases.

In the present section we are concerned with "short-time" phenomena, and a definition of the short-time period alone is here necessary; the definition of the "transitional" and the "long-run" periods may be left for the two later sections which are given to their study. By short-time is meant a period so brief that the underlying conditions which ultimately determine the course of international trade — commodity demand and supply schedules in each country, the "invisible items" (shipping charges, permanent foreign investment, and so on), and similar forces — do not undergo any material change, and can be regarded as substantially constant. For the purposes of the analysis of short-time mechanisms immediately following, a period of a few days is long enough, and the assumption of substantial stability in this period is therefore tenable. No important change in the determinant conditions will occur in this brief time. (The question of the probable duration of that stability under the conditions of actual trade is reserved for treatment elsewhere.) It may also be observed that the foreign exchange market, which is in large measure, of course, ultimately dependent on and governed by the commodity market, has in this short-run period an independent existence prior to the commodity market. As will appear more clearly later, commodity prices proximately follow instead of determine the prices of bills.

With these assumptions and definitions as the basis, we can now turn to our first principal problem, the analysis of the mechanisms governing the operation of the foreign exchange market in a given short-time period. This analysis will deal with four questions, to be taken up in order: first, the nature of the principal media of international payment; second, the mechanism of the exchange market within any given country, and the

character of the equilibrium tendencies appearing there; third, the proximate determination of the exchange rate; and fourth, the probable nature of the par of exchange under paper.

The principal media of international payment available under inconvertible paper may be arranged, in the order of the sensitivity of their movements in response to changes in the exchange rates, somewhat as follows: commodity bills, bankers' drafts, and cable transfers; short-time borrowings between banks (finance bills, etc.); those short- and long-time securities, the international movements of which are sensitive to changes in discount and exchange rates; various "international" commodities for which there is an open market (especially, under the paper hypothesis, gold in its capacity as a commodity); and so on.[9] The wider and more lasting the fluctuations of the rates, the farther into the series will their disturbing effects tend to penetrate. The prices of these media, their values in terms of the money of the one country or the other, are, of course, determined at the time they are credited to the account of the one country, and charged against the account of the other—for commodity bills, for example, at the time the banker mails the bills to the other country for collection. Once this process has been performed, the given media pass out of the exchange market proper, and do not re-enter it. They still affect the commodity market, of course, but this question belongs to another part of the discussion.

Given an exchange market in either country into which all these different media of payment enter, is it possible to establish any general relationships between the prices and quantities of the media in the short-time

---

9. For this suggestion I am indebted to Professor Allyn A. Young of Harvard University. I owe him thanks, also, for invaluable constructive criticism throughout the paper.

period, and to set up any general rule for the determination of the exchange rate? As far as any given bill or draft is concerned, the rate of exchange is obviously nothing more than the numerical ratio between the price of that bill in the money of the one country and its price in the money of the other; between the amount of money that is given for it in the country of origin and the amount of money it will command when presented for collection or payment in the other country. But what happens when a large number of such bills and drafts are being offered or demanded simultaneously? Let us begin by assuming for the moment that commodity bills and bankers' drafts are the only media of international payment being employed. The international bankers of any given country, as A, are on any given day handling two sets of bills and drafts. One consists of the bills and drafts originally drawn in B and now sent to A for collection or payment. This set, however, was subjected to a valuation process in the exchange market at some previous date; that is, its values have already been determined, with reference to the exchange rate then current, in terms of the currency of the one country and the other. Once this valuation was made it passed out of the sphere of the exchange market proper. The other set consists of the bills and drafts, originating in A, which on the given date are being presented to or by A's international bankers for purchase or sale. These bills are the ones entering into A's exchange market for the given day in question, and hence the ones governing the short-time determination of the exchange rate, so far as A alone is concerned.

Banking and commercial practice may result in either of two situations with respect to these bills. Either bankers' purchases and sales of drafts will approximately offset one another; or they will not. Under in-

convertible paper the former is probably the commoner and more typical situation.[1] In that case the constant effort of the bankers will be to avoid any very large excess one way or the other. If purchases in A become materially in excess of sales, then the bankers in A will quote a rate of exchange somewhat more in A's favor. This shift, by making drafts somewhat cheaper and by making the yield of commodity bills somewhat less, will bring demand and supply in A's exchange market more nearly into harmony, while at the same time the shift in the rate will of itself, by changing the terms at which money values are translated from one currency into the other, change the total money values of commodity bills and drafts being currently purchased and sold. It will decrease that of bills, increase that of drafts, and restore the two totals to substantial equality.[2]

For any given period of short duration, say a single day or a few weeks, it then appears that as far as commodity bills and drafts are concerned (provided that the function of the bankers is, as here assumed, this offsetting of purchases against sales) the total money values in the money of A of media of payment payable to A (commodity bills) and of media chargeable against A (bankers' drafts) tend to approach equality. Any upsetting of that equality tends to be corrected by the

1. Of the two countries, one will usually do most of the banking business connected with foreign trade, and the other only the smaller part. And as a rule the exporters in either country will receive payment by discounting bills, instead of by collecting on drafts, to about the same extent that the importers of that country make payments by buying drafts, instead of by accepting bills; that is, the two sets of transactions will in either country alone tend to balance. The existence of a permanent inequality is probably a logical alternative rather than a condition common in actual trade.

2. The term "total money values," used here and throughout the subsequent discussion, is designed to get around the difficulty involved in using either prices alone or quantities alone as a measure of the volume of transactions, or as an index of change. Obviously the quantity of media entering a given market (or, as below, of commodities) might be doubled, and conditions in that market be radically altered, without producing anything like an equivalent change in prices. "Total money values" may be regarded as simply the aggregate of the sums paid (or received); or if the concept of an average can be given significance here, as the product of average price times average quantity.

direct action of the bankers themselves in changing the price they will give or receive; that is, in changing the exchange rate quotation. The rate of exchange, as far as this set of operations alone is concerned, then emerges as the approximate numerical ratio between the total money values, measured in A's money, that are payable to A, and the total money values, measured in B's money, that A has to remit to B.

The same process will, of course, take place in B on the given day. Since substantially the same rate will prevail in both countries at any one time, the rate actually arrived at will be a product or resultant of market condition in *both* countries. On any given day the media of payment originating in A will tend to produce one rate, while those originating in B may tend to produce another, but telegraphic communication will prevent the existence of more than one rate at any given time. And the tendency of the total money values of media of payment chargeable against and payable to either country to approach equality will of course remain effective, with the qualification that the operation of the tendency in the one country will be somewhat modified, and retarded or accelerated, by conditions in the other. Any inequalities between supply and demand arising in either country from the adjustment of the rate will soon disappear, through the operation of the mechanism just discussed. And when the bills and drafts here considered are later presented in B for collection or payment, their total money values in B's money will also approximate equality, since the two sets of values are translated from the terms of A's money, in which they are substantially equal, to those of B's money at precisely the same rate of exchange.

These conclusions, however, have been based on the assumption that bankers' sales and purchases tended

always to offset one another. If, on the contrary, they steadily fail to offset one another, then a continuous transfer of unpaid balances to meet the excess becomes necessary. But this fact does not upset the validity of the argument above, so far as bills and drafts alone are concerned. Suppose purchases of commodity bills by A's bankers to be steadily in excess of their sales of drafts. This excess must be remitted in some way by B's bankers, and if for the moment we continue to assume that commodity bills and drafts are the only media employed, it is clear that it must be remitted by bills against commodities drawn in B, and payable in A. Such bills originate in B, but the moment they pass out of the exchange market — usually on the day of sale — they become credited to A's account in B. They represent a net balance due from B, and as soon as they are credited to A become included in the media payable to A, and are to be set off against the media, originating on that day in A, which are chargeable against A. And A's bankers will not purchase in any short period — a few days or weeks — an excess of commodity bills above their sales of drafts which is substantially greater than the net sums they can expect to receive from B's bankers. For in the absence of media of payment other than bills and drafts they have no alternative way of securing what is due them, and international bankers in general are averse to piling up steady balances due among themselves. The net result will be that the excess purchases of A's bankers in any given short period will be substantially equal to the net balance accruing to their credit in B during that period; a balance which, translated into A's money at the current rate of exchange, will affect their transactions in the exchange market quite as much as tho it had originated in A instead of in B. The tendency of the total money values of media of

payment to approach equality hence continues as effective as before, but with this difference: the equality now exists, not between total values of media originating in A alone, but between the total values of media originating in A and chargeable against A, and those of media originating in A and payable to A, *plus* a certain net balance of other media payable to A but *originating* in B (translated into terms of A's currency at the rate of exchange prevailing when they were credited to A's account in B).

The foregoing discussion, for the sake of simplicity, assumed commodity bills and drafts to be the only media of international payment employed. Under the conditions of actual trade, however, all of the types of media previously mentioned are or may be used. But even if we include all of these various types, the tendency to an equality of total money values of media of payment continues to be substantially valid.

A brief consideration of the proximate, short-time results of a disturbance in the exchange market will make this clear. Such disturbances may arise from either or both of two sources: from commodity transactions, or from the "invisible items" field, especially international borrowing. Let us take a disturbance in commodity transactions first, and assume that because of a marked increase in commodity imports, A has a large balance of payments to make to B. Assume also that the disturbance arises suddenly, in the course of a few days — an assumption of course contrary to the usual course of events, but one which will simplify the discussion somewhat. This situation will obviously upset the previously existing equality of total money values of media of payment in A, so far as commodity bills and drafts are concerned. The volume of drafts now demanded from A's bankers to pay for the new imports will greatly exceed

the supply of bills offered them for purchase; or else the volume of commodity bills originating in B, and sent to A for collection, will exceed that of drafts originating in B and sent to A for payment; or, more probably, both sets of conditions will prevail. A's bankers will then seek means, other than the remitting of bills and drafts, of making payments in B. They will secure short-time loans from B's bankers; they will ship such securities, both short- and long-time, as have a market in B; and if these expedients are for the time being inadequate (for example, the quantity of international securities which the banks can secure at short notice, without an undue advance in price, is probably not large) they will themselves ship commodities that can find an easy market in B. So especially gold, which under the paper hypothesis enters as a commodity alone.[3]

The net effect of this whole process, as far as A is concerned, will obviously be the restoration, with larger items on each side of the equation, of an approximate equality between the media of payment chargeable against A and the media payable to A. For the original increase in the total money values of the media chargeable against A (that is, the bills and drafts based on the original increase in commodity imports) will soon be offset by the increase in the total money values of the media payable to A. That is, the transfer of securities from A to B, the making of loans, and other attempts to effect a payment of balances due, are to be regarded in the first instance as transactions chargeable against B, and payable to A: transfers of securities, other international borrowings, and so on, are in the short-time

3. Under the gold standard, gold would begin to flow before any large movement of securities developed. As far as the proximate mechanism goes, this matter of the relative order in time of the various movements appears to be the chief difference between the operation of the elements in the process of adjustment under paper, and their operation under gold.

view outright sales, and not simply loans. And this short-time equilibrium within either country obviously *must* tend to prevail. Commodity transactions must be paid for almost at once, and international bankers will not as a rule permit large balances to remain long unpaid as between themselves; they will not, and indeed cannot, carry large transactions on their own capital alone for any considerable period. Even if they do so carry transactions the operation, whether undertaken for the benefit of commodity dealers or for other banks, becomes in effect a loan by one country to the other. Under the preceding argument this loan must be placed under the head of media of international payment, and be credited or debited at the rate of exchange prevailing when the loan is contracted.

A similar type of argument applies in substance to the correction of disturbances arising in the "invisible items" fields. New international borrowing on a large scale, for example, will in the *short-time* period, that is to say in the first instance, be offset by increased movements of commodity bills, drafts, short- and long-time borrowings, and so on, in the other direction, with the net result that an approximate equilibrium between "media of payment," in the larger sense of the latter term indicated above, will be restored in each country. If such an equilibrium does not prevail at any given time the exchange rate will move, and by its movement restore substantial equality. Either the movement will cause a change in the volume of the demand for or the supply of media of international payment in each country (especially of finance bills and other short-time borrowings, since the volume of commodity transactions and of long-time investments cannot be materially increased in a few days' time), or it will change the rate at which money values are translated from the one cur-

rency into the other.[4] The repercussion of these changes
on the level of the exchange rates presents quite a dif-
ferent problem, which will be dealt with at another
point; here we are concerned only with the nature of the
short-time mechanism itself, not with the ultimate re-
sults of its operation.

The substantive results of the discussion up to this
point may, for convenient reference, be summarized in
two formulae; formulae, it must be remembered, which
are here intended to apply only to the "short-time"
period, as that period was defined at the beginning of
this section, and which are based on the character of
the operation of the short-time exchange market mech-
anism.

FORMULA I

Total money value in money of A of media of pay-
ment payable to A = Total money value in money of A
of media of payment chargeable against A.

The same formula of course applies to B.

FORMULA II

Either:

Rate of exchange = (Total money value in money of
A of media of payment payable to A) ÷ (Total money
value in money of B of media of payment chargeable
against B),

Or:

Rate of exchange = (Total money value in money of

4. It may also be observed that the tendency toward a restoration of equality between
the total money values of media of payment, made effective primarily through a change
in the exchange rate quotations, will be still further strengthened in the case of large
disturbances by the movement of the discount rate. If there is a large increase in the
demands upon bankers for accommodation, whether it be for the sale of drafts or for the
purchase of commodity bills, this drain of bankers' capital into international trade will
cause a rise in the price charged for the use of such capital (that is, in the discount rate),
and thus still further check the disturbance, unless international trade plays a wholly
insignificant part in the transactions of the given banking center. For a tentative
statistical examination of the correlation between exchange rates and the rate of dis-
count under the gold standard, see the article by E. G. Peake in the Bankers' Magazine,
(London) for August, 1921.

A of media of payment chargeable against A) ÷ (Total money value in money of B of media of payment payable to B).

With reference to the first formula, which expresses the equilibrium tendency just examined, this equality between total money values of media has been spoken of above as "approximate." How close is the approximation? Obviously the total values for any given day will not necessarily be equal. But if the previous argument is valid any daily inequality will at once tend to produce its own correctives, in the movement of the exchange (and discount) rates and in the effect of such movements on the demand and supply of media of payment. Since the fluctuations in the exchange rates are themselves the measure of the divergence, the relative inequality can be no greater than the relative amount of the movement of the exchanges between the time they begin to move and the time that the corrective influences become effective. Since this last period is very short (the first shock will probably be taken up in large part by finance bills, which can of course be created very quickly), the inequality will presumably be small at any one time, and will tend always to disappear entirely. It must be remembered, also, that this formula was derived only with reference to the exchange market transactions of a given "short-time" period. When the so-called "underlying conditions" change substantially they will of course end the life of the given period, and they may or may not set up another in its stead.[5] But while the actual content of the terms of the formula will then be materially altered, the effectiveness of the tendency it expresses continues unimpaired. Whatever the time period held in view, the total money values of the media of payment originating in that period which are charge-

5. See the discussion on this head in Section IV, below.

able against any given country, and payable to it, will tend always to approach equality.

The validity of either of the alternative statements of the second formula appears almost by inspection. Under the assumptions on which this whole paper is based, there is nothing other than the total money values set upon the media of payment entering the market which *can* determine the exchange rate. In other words, the rate is simply the numerical ratio between the total money values, in the money of either country, that are paid in that country for the right to receive certain sums in the other country — that is, for the title to certain media of international payment — and the total money values, in the money of the other country, that ownership of these media entitles the holder to receive. Both prices and quantities enter into its determination, not prices alone. The two alternative statements may seem to permit the derivation of two distinct rates at the same time. But it is unnecessary to do more than state the fact that modern cable communication, and the high degree of organization of modern exchange markets, make impossible the simultaneous existence of two substantially different rates. Only one will prevail at any given time. This rate will be the resultant of exchange market conditions in each of the two countries. Through the process of adjustment already considered in connection with Formula I, the total money values of the media of payment offered and demanded in each country, if they fail of approximate equality at the then current rate, will alter that rate and in turn be altered by it, until for any given day a rate is established which will hold market conditions in both countries in substantial harmony. This of course does not mean, however, that the rate will be an exact mechanical quotient obtained solely from the media of payment entering the

market on that given day alone; speculation and other "extra-mechanical" forces will to some extent modify its theoretically rigid determination, and tend to average up the day-to-day fluctuations in the demand and supply of media. Since these other forces, however, must of necessity find their expression through the agency of total money values, their existence does not constitute an exception to the foregoing analysis.

The preceding paragraphs have been concerned with the nature of the short-time equilibrium tendencies appearing *within* a given country with respect to media of payment. There is also some reason for believing that an equilibrium tendency exists, even under paper, *between* the two countries: that in the short-time period a true par of exchange will appear. But whereas the equilibrium of media of payment will tend, I think, to hold good for any time period whatsoever under paper, precisely as it does under gold, any given parity under paper is wholly dependent for its existence, as will be demonstrated shortly, upon the existence of substantial stability in what have been described as the "underlying conditions" governing international trade, and is indeed created by that stability. As soon as these conditions change materially in either country the given parity is destroyed.

The question of how long this "stability" may properly be supposed to continue is too open to debate to permit the basing of any very positive conclusions upon its existence, and I shall therefore simply present for what it is worth a brief outline of the argument leading to a belief in the existence of a paper parity, without attempting to make this parity an integral part of the general structure of the international exchange process under paper. It must also be remembered that even if such a parity does exist, its actual importance in the

conduct of trade depends entirely on how long any one period of "stability" in the general conditions of trade can be supposed to endure. If the period is presumably very short, the parity will have little or no effect on the conduct of trade; if long, it may play a part almost as great as that of the gold parity. The decision is left to the reader.

The economic conditions in each country which ultimately determine the course of international trade may be grouped under two more specific heads: first, the demand and supply schedules in each country for "international" commodities (and indeed, in the ultimate sense, for all commodities); and second, the so-called "invisible items" in foreign trade — charges for shipping, foreign investment, and so on, which are created by the demand and supply of services as well as of commodities. For the purposes of the present inquiry, let us assume that these determining conditions are for the time being constant; either that they do not change enough to affect foreign trade materially, or that the changes in them offset one another.[6] Assume further that the rate of exchange prevailing at the beginning of this period is stable — that is, that it expresses these conditions accurately, and holds them in balance. Given these assumptions, it then appears that certain forces exist in the mechanism governing the exchange of media of payment which will tend to check any movement of the rates away from the level of stability, and to restore them to that level.

Suppose the rate, through some purely temporary cause which is at once removed and which does not

6. These conditions are probably, in actual trade, in a state of slow but constant change. The amount of the net change in any short period, such as a few days or weeks, will ordinarily, however, be very slight, and with respect to such a period these conditions cannot inaccurately be regarded as substantially constant. The assumption of "stability," when made in connection with a discussion of short-time phenomena, is therefore not unreasonable.

affect the underlying conditions, such as an inaccuracy in the competitive mechanism, to move relatively against A. These results will then follow. First, an increased offer in A of commodity bills, a decreased demand for bankers' drafts, and so on through the other media of payment, together with an increase in the total money values of bankers' purchases in A, and a decrease in their sales. Second, an increase in the total money values of media chargeable against A, and a decrease in those payable to A; and an opposite movement in B. Finally, altho the temporary cause of the disturbance is soon removed, and the additional payments due to B are soon made, a rate of exchange will remain which leaves A's bankers with balances to pay to B's bankers: the media-of-payment equilibrium (Formula I) is upset. At this rate, favorable to those having payments to receive in A and unfavorable to those in A who have payments to make to B, the supply of media payable to A is in excess of the demand for media chargeable against A, and A's bankers will therefore quote a new rate, that is to say will offer a new price, more in A's favor. For such a rate will tend to restore substantial equilibrium between the total money values of media of payment, and to make the bankers' accounts with B balance. The reverse process will take place in B. At the same time the movement of the rates against A makes A attractive to B's bankers and exchange speculators for the placing of short-time loans (if they suppose, that is, that the rate will eventually return to something like its original level). This short-time lending will *of itself* tend to shift the rates in A's favor, since it represents, for the moment, an attempt by B to make payments to A.

Both sets of forces, international short-time borrowing and the direct effect of changes in bankers' quotations of rates in the exchange market, are thus working

to check the movement of the rates, and to bring them back. If the original cause of disturbance be assumed, as above, to be temporary and to disappear almost immediately, it is clear that the return movement of the rates will go on, presumably with various irregular oscillations and counter-movements, until a rate is established which once more satisfies the underlying conditions; that is, until the original rate is restored. For while such a disturbance will presumably affect commodity prices and even commodity movements for the time being, the ultimate determinants of the course of trade, namely the demand and supply schedules for commodities and services, are under the original assumption above not affected. When the disturbance is removed they will reassert themselves, and cause the restoration of the original rate of exchange: granted that monetary stability which was assumed earlier in the paper, no other forces *can* determine it.

In this short-time period, therefore, there is reason for thinking that a self-restoring equilibrium of the exchanges will tend to appear, based primarily on the movements and prices of media of payment, and created simply by the temporary stability of the underlying economic conditions existing in each country. In this sense it then becomes proper to speak of a par of exchange even under paper, tho always with the qualification that its existence depends upon the continuance of this stability; a parity which is derived empirically, and which emerges simply as the level to which the rates tend to return. The nature of the parity in a long-run period, during which these conditions will necessarily change, will be examined in a later section; here we are concerned only with the short-time aspects. It may be added that the paper parity will probably be not a specific rate as it is under gold, but a narrow zone. In

the absence of a definite basis for the parity, such as that provided by the ratio between physical weights of standard coins under the gold standard, the operation of the "determinant forces" will probably not be sufficiently rigid and accurate to cause the emergence of a single flat rate. Within this zone, any rate will presumably satisfy trade conditions, and operate as an effective parity. As to the probable width of the zone, it is hard to say. Even under paper a movement in the rates as great as two or three per cent would probably cause a marked counter adjustment in the exchange market, but beyond that I should hesitate to go.

III

We pass now from the short-time mechanisms governing media of international payment to our second principal problem: the commodity market and the relationships between the total money values of a given country's commodity imports and exports. In making this transition we must also change the time period to be held in view. For the treatment of the proximate forces of the exchange market, the "short-time" period defined above was a satisfactory basis. But changes in the commodity situation usually require a time much longer than any one such period to work themselves out. On the other hand, the present section is not concerned with the ultimate effects on the general levels of commodity prices and money incomes of such changes: these questions will be taken up at a still later stage. Rather, it is primarily concerned with the proximate mechanism by which changes in the exchange market are transmitted to commodity prices and movements, and with the immediate effects of such changes on these prices and movements. The time area involved is necessarily in-

determinate, and may therefore be designated as a "transition period" between the true "short-time" period of the exchange market and the period required for the appearance of the ultimate effects of a given disturbance on prices and incomes. Something like a year would probably be a reasonable estimate of its usual duration. It is obvious, however, that a time area of this size may embrace two or more "short-time" periods in the exchange market proper, and that the working-out of the effects on the commodity situation produced by the phenomena of any one such short-time period will be blurred and obscured, in its later stages, by the immediate effects on commodities of subsequent changes in the exchange market, arising in a subsequent short-time period. To avoid this difficulty, and to simplify the discussion, these subsequent changes will be ignored here. We shall consider only the mechanism through which, in the course of the transition period, the conditions of the exchange market in a single short-time period alone, even tho this last be of only a few days' duration, are passed on to, and reflected in, the conditions of the commodity market.

It must be observed that this part of our general analysis is not concerned with the why and the how of international commodity trade in general, nor with the forces that ultimately determine international commodity prices. Fundamentally, of course, the commodity market in large part creates and governs the exchange market, but here we still have in mind a period short enough to permit the exchange market to be regarded as having an independent existence prior to the exchange market: so that commodity prices follow, instead of preceding and themselves determining, the prices of media of payment. Taking an international commodity trade for granted, and assuming the under-

lying determinants of that trade to be in a state of substantial stability, we shall here consider only the changes, within the limits of that stability, which may arise in the media of payment — commodity relationship in a comparatively short-run period. The discussion involves three questions, which will be taken up in order: first, the conditions proximately determining the total money values paid and received for commodity imports and exports; second, the nature of the equilibrium tendencies between such money values; and third, the process by which the volume of commodity movements is affected. After this examination of the character of the particular mechanisms involved has been completed, an attempt will be made to trace the operation of the mechanism as a whole in a specific case of disturbance.

(1) If we define import prices as the prices that the importer pays for the given commodities in the money of his own country, and similarly define export prices as the prices received by the exporter in the money of his country,[7] it is obvious that the commodity market is, in the first instance at least, dependent on and in point of time subsequent to, the exchange market: the prices actually paid or received for commodities in the commodity market are the prices previously paid or received (with allowance for brokers' charges) in the exchange market for the media of payment based on these commodities. But it is also obvious that the given commodity prices may be paid and received not at the same instant that the corresponding prices are paid and received for the corresponding media of payment (that is, not when the total money values of these media are determined, in the money of the one country and of the

7. That is, we are not here concerned with the price that the ultimate consumer gives, or that the ultimate producer receives, unless these persons chance to be themselves importing or exporting directly.

other, by their purchase and sale in the exchange market) but at some later date. The transmission of total money values from the buyers and sellers of media of payment to the buyers and sellers of commodities, and the working-out of the effects of changes in these money values, will ordinarily involve certain "lags" in point of time. The amount of the lags will depend upon the time required to ship commodities from one country to the other, the form of the media of payment employed, and the character of the particular businesses. Disregarding the effect of the "invisible items," which may lessen or increase the amount of the changes in the commodity situation, but which will not alter their qualitative character,[8] these lags are of two sorts.

First, the lag arising in particular transactions. The price established in the exchange market for the media of payment based on a given commodity transaction will, if a bill of exchange be used, determine the *export* price of the commodities involved as soon as the bill is discounted. But those commodities will not enter the *importing* country, obviously, until the time required for their shipment has gone by. Nor will the price originally established in connection with them in the exchange market become a commodity *import* price until after this lapse of time: the commodities are simply not there. If on the other hand bankers' drafts or cable transfers be used, which do not enter the exchange market until after the commodities have been received as imports, the import price is immediately determined with reference to the then current rate of exchange, practically synchronously with the determination of the price of the corresponding medium of payment. But the export

8. Unless changes be assumed to take place independently in the invisible items themselves during the period of the operation of the proximate commodity mechanism. This possibility, tho more apt than not to present itself in actual trade, may be ruled out here to simplify the exposition.

price which is received in the other country for these goods may be determined then; or the precise sum that the exporter was to receive in the money of his own country may have been agreed upon previously. In the latter case the import price will be determined by translating this export price into terms of the other currency at the now current rate of exchange, and will be established at a time subsequent to the establishment of the export price by at least the length of time required to ship the commodities. The same thing holds substantially true if the exporter, on the basis of his sales contract with the importer in the other country, is able to borrow from a bank the amount (subject of course to discount by the bank) that he will later receive from the importer.

This lag, however, arises only in relation to a given commodity transaction, and does not necessarily occur in all cases, and while its general effect is probably to cause the import prices of a particular parcel of commodities to lag behind the corresponding export prices, it is perhaps not very important. The second lag, which affects the general body of commodity transactions as a whole, is of greater significance. It arises from the fact that the full effects on commodity prices of any important change in the level of the exchange rates will not necessarily be felt at once, or even at the end of the time lag considered above. Nor can the nature of these effects be predicted in general terms. A given change may operate, for example, to the disadvantage of A's importers, relative to a particular commodity transaction. But only when the next contract is made between A's importers and B's exporters can the full results of the change be seen, for the original commodity transaction was contracted for *before* the given movement in the rates took place, and the gain or loss from the move-

ment, depending on how the contract was drawn, must be accepted without recourse. When a new contract is arranged, however, this movement can be allowed for in the terms of the contract. Needless to say, small or obviously temporary movements in rates will hardly affect commodity transactions; and, also needless to say, the nature of the new arrangement, the distribution of the gain or loss, will depend on the relative advantage or disadvantage in trade of the particular dealers and of the particular countries as a whole. No general prediction is possible. A movement of the rates against A, for example, may cause a rise in A's import prices, with no change in B's export prices, or a fall in B's export prices with no change in A's import prices; and it may cause a rise in A's export prices with no change in B's import prices, or a fall in B's export prices with no change in A's export prices. More probably, the gain and loss will to some extent be divided between the various dealers in the two countries: all four sets of prices will shift somewhat. It must further be observed that in many cases, if not in most, speculation will tend to decrease the time required for these price adjustments, and to diminish the disparity between the various sets of prices. Where the market for the given commodity is highly organized, as for wheat, speculative forces will cause the prices of that commodity in the importing country to adapt themselves to the probable prices of these imports long before they are received or even shipped. With this process, however, we are not here concerned.

(2) So much for the elements in the proximate mechanism connecting commodity prices with the exchange market. It is clear that in the short-run or transitional period here under consideration any given condition in the exchange market will tend to be reflected, with the

indicated lags and barring other disturbances, in the markets for commodities and services, including foreign investments; [9] and it therefore follows that the equilibrium tendency of media of payment in the "short-time" period, summarized in Formula I, will also tend to appear as between the total money values of a given country's exports and imports. That tendency may be expressed as follows:

FORMULA III

Total money value in money of A of A's exports = Total money value in money of A of A's imports.

The same formula, of course, applies also to B's exports and imports.

The term "imports and exports" however, under the conditions of actual trade, of course includes both commodities and services, and the formula therefore applies simply to the *totality* of a given country's international dealings. It governs the total money values, measured in the money of the given country, not only of commodity transactions, but also of international borrowings (regarding these borrowings as being in the first instance an outright payment from one country to the other, and their liquidation as another and separate payment), of shipping charges, and of the various other invisible items.[1] If all prices for such goods and services

9. Should the conditions of the commodity and other markets thus established not be in substantial harmony with the underlying economic conditions in each country, or should these last conditions themselves change, the result will, of course, be a change in the situation in the commodity markets, and a reflection of this change in the exchange markets and exchange rates. But such changes require a longer time to work themselves out than the "transitional" period here held in view embraces, and they involve a study of certain forces not relevant to the present discussion. Consideration of them is, therefore, reserved for a later part of the paper. See especially the first half of Section IV, below.

1. No attempt is made in this paper to discuss the mechanism of international borrowing, but it is obvious that such borrowings are of two distinct types: short-time loans, effected between international bankers, and primarily a phenomenon of the

were paid and received instantaneously with respect to any given transaction, and if changes in the exchange market produced their full effects on commodities and services immediately, this formula would be a necessary and immediate corollary of the media-of-payment formula. Since these conditions of course do not prevail in a dynamic state of trade, the operation of the tendencies it expresses is necessarily blurred and retarded, and it therefore presents a correspondingly less accurate picture of actual conditions. The existence of the various lags previously examined makes it necessary to take as the basis of the formula, not the total money values of the imports and exports entering or leaving a country in any given day or other period, but the total values of those exports and imports which are related to the *exchange market* transactions of that day or period. In other words it obtains its validity and is brought into substantial effect, not from transactions in commodities and services as such — not from the direct relations, for example, between A's exporters and A's importers — but from the operations of the foreign exchange market; that is, from the competition between, and the relations of, international bankers. Under modern conditions it tends to be valid *because* the media of payment formula is approximately valid. It is a resultant only, and there is probably nothing in the mechanism of international transactions in commodities and services alone, as these transactions are now conducted, which would independently make it effective even under the gold standard.

money market alone; and long-time loans effected for industrial, governmental or other purposes. The effects of any large movement in the international trade situation will be much more permanent and far-reaching for the second class of loans than for the first, and will operate through somewhat different mechanisms. The reader may also be reminded again of the fact that all the elements going to make up the totality of a given country's exports and imports, whether commodities or invisible items, will at some stage in their life history enter and affect the exchange market. For the purposes of an examination of such imports and exports which takes the exchange market as its point of departure, it is therefore not misleading to regard these elements as homogeneous.

The formula here derived is of course based only on those commodity (and services) transactions which are related to a given set of media-of-payment transactions of a particular "short-time" period in the exchange market. When we attempt to consider the first type of transactions as a whole, and to take an area in time larger than any one such short-time period, the situation with respect to commodities and services becomes very complicated. It is no longer permissible to assume substantial stability in the underlying conditions, and any one chain of effects therefore blurs the operation of preceding and of subsequent chains, and in turn is blurred by them. But the equilibrium tendency with respect to any given set of transactions that find expression in a common exchange market (whatever be the time area of that market) of course continues in operation, and in the long run will be substantially effective for the totality of a given country's trade, irrespective of such time areas in the exchange market alone. Temporary inequalities in particular transactions will largely cancel and disappear in the aggregate of transactions. It is therefore presumably true, as it was for the media-of-payment formula, that whatever the time period selected as the basis, the commodities and services formula is substantially valid for the transactions occurring within that given period.[2]

2. No attempt has been made in the foregoing discussion to show the analogy of the short-run mechanism under inconvertible paper to that under gold, but with certain obvious exceptions this analogy between the mechanisms as such, tho of course not between the results of their operation, is in many respects very close. The three formulae, also, with the qualifications made necessary by the introduction of gold as a part of the legal currency, are presumably as valid under the gold standard as under paper. An application of the method of analysis outlined in this paper to the conditions of international trade under the gold standard, where a conclusive statistical basis can more easily be obtained, might well cast new light on the older theory.

It may be added that a formula for the determination of the exchange rate can be based on exports and imports. Since one country's exports are the other country's imports, under the original assumption of trade between only two countries, the rate can be regarded as the numerical ratio between the total money values in the money of A of A's exports, and the total money values in the money of B of B's imports; or vice versa.

(3) The next question to be considered in connection with the mechanism of the relationships between the foreign exchange markets and commodities is that of the process by which changes are transmitted in the first instance to the volume of commodity movements. (The effect of the invisible items is again disregarded.) The transmission, in addition to the lags of commodity prices behind the prices of media of payment which we have just examined, involves another lag arising from the inevitable delay in the reflection of changes in commodity prices in the volume of commodity movements. The amount of these last changes, even in the first instance, is not necessarily predictable. Suppose, without as yet examining the detail of the process in a particular case, that the net result of a movement of the exchange rates against A is a higher level of the prices both of export and import commodities in A. A's exporters, on finding that they are going to be able to secure a higher price than before for their commodities if import prices in B are left unchanged, may simply elect to pocket the gain without attempting any change in the volume of sales; or they may take advantage of the change to increase their sales by quoting a lower price abroad, and themselves receiving only the original price. And A's importers, on finding that they must pay higher prices than before, may cut down the volume of their purchases and thus, assuming the export supply schedule of the other country to remain unchanged, force a return to the original price paid by them (in which case *export* prices in B will fall); or they may find it possible either to absorb the loss themselves or to pass it on to the domestic distributive system, without reducing the volume of

But such a derivation of course yields only the rate which tends to appear as a "normal" or average level with respect to the given set of transactions, rather than the rate actually quoted on any given day: that rate is, as already indicated, proximately determined with reference to the total money values of media of payment 'entering the exchange market.

the flow of goods. If on the other hand the result of the movement of the exchanges against A were, not a rise in A's commodity price levels, but a fall in B's price levels with no change at all in A, the opposite chain of argument would apply to B's exporters and importers. The volume of B's commodity exports might stay the same, or fall off; of imports, stay the same or increase. Finally, if the movement of the rates affected commodity prices in *both* countries, as would more probably happen in actual trade, the result would be an unpredictable and indeterminate blending of these two types of change in commodity movements. And the closeness with which the change in commodity movements would follow that in the exchange rates is also unpredictable. In addition to the "lags" of commodity prices behind the prices of media of payment, there is also a possible lag due to the varying rapidity with which exporters and importers can or will change the volume of their purchases and sales.

Only by assuming a movement in the exchange rates so great and of such duration that if a loss were involved exporters and importers and the distributive systems could not absorb it, or that if a gain were involved competition would break up any general attempt to monopolize it, can we safely assert that a change in the volume of commodity movements will necessarily follow a movement in the exchange rates. And even with this assumption neither the amount of the change nor the closeness with which it will follow the movement in rates can be definitely predicted; only its direction can be foreseen. Finally, the various alternative results that can follow any given movement in the exchanges are so numerous that a positive statement as to the nature of the probable effects on commodity price levels, and on commodity movements in general, can have but little significance. Before any one such move-

ment can work itself out another will begin, and the results of the first will become inextricably blended with those of the second. The effects of such a movement on the "invisible items" will be equally complex and unpredictable, but under the original assumptions leading to a virtual elimination of this field they may be ignored here; granted monetary stability, the dominant and determinant factor in international trade will of necessity be commodity transactions and commodity movements.

We have now completed our examination of the various elements of the mechanism which proximately connects the exchange market with commodity prices and commodity movements in the "transitional" period. To present a more coherent picture of that mechanism as a whole it will perhaps be profitable to trace through the effects of its operation in a specific illustrative case of disturbance — disregarding, for the purpose of the argument, the effects of those subsequent disturbances which would almost certainly arise in actual trade before the original chain had worked itself out. Let us take two countries, A and B, and assume that some change in the general industrial conditions of B results in a considerable increase in B's demand (in the schedule sense) for imports of steel from A. Assume also, to simplify the discussion, that the net result is a permanent increase in the volume of these steel movements.[3] What will happen?

B's demand for A's steel has undergone a marked increase in the schedule sense, but the new price level for imported steel, whether higher or lower or the same as before, and the extent of the increase in the volume of

3. In other words we are materially altering the "underlying conditions" governing trade, and attempting to trace the process by which exchange and commodity markets adjust themselves to the new status of these conditions. To simplify the discussion still further we may also assume that the change takes place rapidly, and that the underlying conditions then resume substantial stability for some time, tho of course on a new level; that is, no further fundamental disturbances are introduced.

commodity movements, cannot be determined except with reference to the new level of costs of production for steel in A, and to the exchange rate. The cost of producing steel in A will presumably rise at first, from the operation of temporary increasing costs, altho ultimately, when the steel industry has become adjusted to the increase in output, the operation of decreasing costs will probably cause the price of steel to fall below the original level. The transmission of these various effects to the importers of steel in B, however, will in turn depend upon the level of the exchange rates, and to their determination we must first turn. It is obvious that if we can assume the general character and volume of the trade between the two countries to remain for the time being unaltered, except with regard to steel, the exchange rate will move in A's favor. (The detail of the change will be considered in a moment.) This movement will, by tending to lower A's export prices, discourage A's steel exporters, while by tending to raise B's import prices it will discourage B's steel importers.[4] The net result will be a somewhat smaller increase in the volume of steel movements than would have taken place had the old exchange rate been maintained; and, unless A's steel exporters will accept the whole loss in order to expand their market to the utmost, a rise in the prices of steel imports in B.[5]

4. Theoretically, A's export prices might continue unchanged, and B's import prices be lowered by the amount of the shift in the rates; or B's import prices continue unchanged and A's export prices rise. In actual trade both sets of prices will almost certainly be affected somewhat.

5. In the long run, when the operation of decreasing costs will presumably cause a decline in the prices of steel exports in A, the prices of steel imports in B will fall and the volume of the steel movements will increase somewhat, unless the steel exporters in A elect to keep all the gain and do not attempt to increase sales. If the total money values of the steel exports continue unchanged the exchange rates will not be affected. If they are altered the rates will shift also, and slightly modify these results. The primary determinants here are of course the supply schedule for steel in A, and the demand schedule in B, together with such changes as may occur in those schedules.

With respect to the general question of changes in the level of export prices, it may be

So much for the effects relative to steel alone. There remains for consideration the question of the effects on the exchange rate and on commodity movements in general. The mechanism of the operation of these effects has been indicated at some length in the preceding pages, and need not be presented in detail here. The increase in exports of steel from A will cause an increase in the demands upon international bankers for means of payment in A (an increased supply in A of bills of exchange, or an increased demand in B for bankers' drafts, etc.), and consequently a movement of the exchange rate in A's favor. This movement, as explained elsewhere, may by simply changing the ratio at which money values in the one currency are translated into terms of the other be of itself sufficient to restore equilibrium in the exchange market. More probably, by making A a favorable place to sell goods, and B a favorable place to buy, it will call forth an opposite supply of or demand for media of payment, largely based on goods, and adequate to offset those media newly created by the steel transactions.[6] In both cases A's imports would be encouraged and her exports discouraged, through the mechanism and with the "lags" previously discussed; and, as was also indicated above, the change in commodity prices and movements will in turn result in a shift of the exchanges somewhat in B's favor. Whether or not the shift will be all the way back to the former level will depend on the relative advantage in

added that in manufacturing the most probably result of an increased output, if the increase be an appreciable percentage of the former output, is of course increasing cost at first, followed by decreasing cost as the industries adapt themselves to the new demand. For agricultural products the second stage is less likely to follow, unless the increase in demand be so great as to induce radical improvements, and in any event will probably appear much more slowly. The ultimate results of disturbances in this field would, therefore, be somewhat unlike those of the industrial disturbance here considered.

6. A small movement might be offset by the transfer of international bankers' capital from one country to the other, without affecting commodities at all, but a movement of any importance and permanence will almost inevitably affect commodities.

trade of the two countries in the light of the new steel movements.[7]

The initial results of the steel transactions on the general trade situation then are, first, a movement of the exchanges in A's favor; second, an increase in the volume of A's commodity imports and a probable decrease in the volume of A's exports other than steel; and third, a return movement of the exchanges in B's favor. Beyond this point it is hardly profitable to push the analysis of the mechanism. The changes in the volume of A's exports and imports, because of their reaction on the demand and supply schedules of both countries, will in due course and after various lags again affect the exchanges somewhat, and this movement will start another cycle. The process becomes similar to a decreasing spiral, and need not be pursued farther. The two things of significance, which bring some order out of this chaos, are first, the tendency of the total money values of the media of payment chargeable against and payable to any given country to approach equality (Formula I); and second, the tendency of commodity prices and commodity movements to follow, with the indicated lags, important changes in the prices of the corresponding media of payment.

The net effect on the exchange rate, so far as the steel transactions alone are concerned, will probably be some permanent shift in A's favor. Inasmuch as B is taking an increased quantity of goods from A,[8] without any

7. The ultimate result of the steel transactions might be the simple substitution of steel for some other commodity or commodities in A's export trade; or A might be induced to accept new imports from B that would offset the steel exports in the exchange market. Obviously the results on the advantage in trade, on the levels of export, import, and domestic prices, and even on the exchange rates, cannot be predicted except in terms of the trade of particular countries at particular times; and even this prediction would be dubious. See the discussion, however, in the next section.

8. Any large increase in particular commodity imports will in actual trade almost certainly produce some permanent increase in the totality of imports; and in the first instance will cause a very marked increase. See footnote 6 above.

accompanying increase in A's schedule demand for B's products, B can only make the additional payments for these goods by offering its products at a somewhat lower price in A than before. The application of Formula II to B then indicates that the rate will move permanently in A's favor: the total money values of media of payment chargeable against B, and measured in B's money, will increase relative to the values of these media when they are regarded as payable to A, and measured in A's money. In other words the underlying conditions governing trade have altered permanently, and a new level of the exchanges is required to satisfy them. Also, a new parity will emerge, if the earlier argument under that head be accepted. It may also be observed, for reference later, that since the additional goods B is now sending to A to make the requisite additional payments are being offered at a lower price in A's money, the increase in the quantity of these goods necessary to make their total money values in A's money equal the total money values, also measured in A's money, of the new increment of commodities now being demanded by B from A — that is, of B's additional steel imports — must be somewhat *more* than proportionate to the increase in the quantity of these steel imports alone.

The substantive conclusions of the discussion in this and in the preceding section may be stated very briefly. First, an examination of the character of the media of international payment entering the exchange market under an inconvertible paper régime, and of the processes by which their prices were determined, led to the conclusion that an approximate equality would tend always to manifest itself between the total money values of media of payment chargeable against and payable to any given country, with reference to any selected time period in the exchange market. Second, and incidental

to the establishment of this conclusion, it was found that the exchange rate tends, as far as its immediate derivation is concerned, to be simply the numerical ratio between the total money values in the money of the one country, and the total values in the money of the other country, of the media of payment chargeable against or payable to either country. Some reason was also discovered for believing that a true parity might arise, even under paper, in the short-time period, altho the argument was admittedly inconclusive. Third, an investigation of the connection between the prices of media of payment and the prices of the corresponding commodities showed that the transmission of changes from one to the other involved certain time lags, and other inaccuracies, which are not entirely predictable. Fourth, the total money values of a given country's exports and imports were seen to have a constant tendency to approach equality, if the term "imports and exports" be so interpreted as to include the invisible items as well as commodities. Finally, an analysis of the process by which the volume of commodity movements is affected by changes in the exchange market revealed the nature of the mechanism and of the additional time lags involved, but showed also that the number of the alternative possibilities in any particular case made a definite statement as to the net effects on commodities impossible, even for the comparatively brief "transitional" period in the life of the given operation.

IV

The discussion up to this point has been primarily concerned with "short-time" or "transitional" mechanisms in the foreign exchange and commodity markets, and has made the exchange market prior in point of

time to the commodity market: it has regarded commodity prices as resultants rather than as determinants of the prices of media of payment. This method of approach is valid for a treatment of the short-run period, but in the ultimate view of the case commodity prices and commodity markets are of course the real determinants. The present section takes this "ultimate" view as its basis. It will attempt to deal with certain long-run aspects of the foreign trade situation, and especially with the question, hitherto necessarily neglected, of the relationships prevailing between international conditions and the more purely domestic conditions within any given country. Of the various specific problems which at once suggest themselves we shall consider only four: first, a continuation into the long-run field of the earlier examination of the working-out of the effects arising from a given case of disturbance in the field of international trade proper; second, an examination of certain aspects of the long-run relationships between the various kinds of prices — export, import, and domestic; third, a brief consideration of the connection between international trade and the phenomena of the business cycle; and finally a tentative investigation of the probable character of the par of exchange under inconvertible paper, in the long-run period.

It will be remembered that the specific disturbance discussed at the end of the previous section arose from a marked increase in the demand of B for the steel exports of A. The ultimate results upon general price levels and money incomes of the working-out of the effects of any single process of this sort would, under the conditions of actual trade, be almost certainly blurred and hidden (as was explained above) by the effects of subsequent disturbances in the exchanges, and of disturbances arising from sources other than the field of international trade

alone. If however we can be permitted, for the purposes of the argument, to abstract from these other disturbances, we can then indicate to some extent the probable nature of the effects on prices in general, and on money incomes.

To return to the earlier hypothesis, A is now exporting much more steel to B than before. This increase may simply represent a diversion of A's production of steel from domestic markets to the export trade, and a shift of labor and capital from domestic to export manufacture, but more probably the larger part of it at least, assuming a substantial increase in exports, will be new production. Furthermore, this new steel may be a net addition to the volume of A's exports; or it may represent in some part simply a substitution of steel for exports of other commodities. The first alternative will presumably be the immediate result; the second, the ultimate one, since the general tendency of the exchanges to move somewhat in A's favor will restrict those exports of other commodities which had only just been profitable at the former rates. Eventually, then, the volume of A's exports will be increased by an amount somewhat less than the increase in the volume of steel exports alone.

What of the volume of A's imports? B must make to A an increase in payments great enough to offset in the money of A the increase in A's exports, and under the rigid paper hypothesis these payments will in large part be made in commodities. A part of the payments, also, may be made by a shift in the balance of the "invisible items," but for reasons explained earlier in the paper this form of payment will be neglected here.[9] The net

9. If independent disturbances in this field be ruled out, as they were by the original hypothesis of isolation in connection with the present chain of effects, the invisible items will not introduce any qualitative modifications into the conclusions reached. Their effect will simply be, by their absorption of a part of the disturbance in the general situa-

immediate result of this disturbance, as was shown in the last paragraphs of the previous section, was a movement of the exchange rate against B. Therefore an increase in the volume of B's exports, more than proportional to the increase in the volume of A's exports, will now be necessary to effect the required additional payments: B's products are worth relatively less than before in A's money, and A's products relatively more in B's money. It is true that insofar as the steel exports tend merely to replace certain other items in the totality of A's exports, an increase in payments by B will become unnecessary; and insofar as the exchange rate, even with an increase in payments by B, tends to swing back to the original level — a possibility suggested in the earlier discussion of mechanisms — a more than proportionate increase in the *volume* of B's exports will also be unnecessary. But if the new commodity transactions are of any considerable size, only an abnormal peculiarity in the conditions of demand and supply will prevent some permanent shift of the exchange rate in A's favor, as far as this series of causes alone is concerned.

The net long-run results of these changes can be stated briefly. There has been an increase in the volume of A's exports, but a more than proportionate increase in the volume of B's exports; hence there will be more commodities than before in A, and less than before in B. Under the quantity theory, and with the original assumption of a fixed quantity of money within each country, this will mean some eventual fall in the average of A's prices, and some rise in the average of B's.[1] On

tion, to diminish the quantitative importance of the effects passed on to commodity prices and movements. The invisible items of especial importance in this connection are transfers of international bankers' capital, and transfers of investment capital. The former, primarily in the guise of finance bills, are the principal agency through which large disturbances will in the first instance be checked and absorbed.

1. These results would seem to be in diametric opposition to those obtaining under gold, for in the strict Ricardian reasoning a new need on the part of B to make payments

the whole A gains, and B loses, from the results of the train of effects produced by the increase in the steel transactions. A's people gain insofar as their money incomes fail to reflect, or lag behind, the fall in commodity prices (which is presumably not great, however, since the change in the total volume of commodities in A is small, relative to that volume); and they gain directly, insofar as they are consumers of imports, from the lowering of the level of import prices.[2] Moreover A, as a country, is receiving more commodities than before from B, while she is paying for those commodities with a less than proportional increase in her own exports: she is getting her imports at a *lower* commodity price. *Mutatis mutandis*, B's people lose. For them the level of import prices has risen, money incomes will lag behind or fail to reflect the rise in prices, and B, as a country, is paying a *higher* commodity price than before for her imports. Further, money incomes in A's export in-

in A would lead to a flow of gold, a rise of prices in A, and a fall in B. But I cannot see that the results in the two cases are necessarily inconsistent. Under the gold standard, if B has new payments to make to A, part of those payments will of course be made in gold, if the exchange rates move far enough; and to this extent the Ricardian reasoning as to the effects on prices is valid. But a large part of the payment — and, if the latter is of considerable size, perhaps the largest part — will be made in commodities, precisely as under paper; and as far as these commodities alone are concerned prices will be affected, under the quantity theory, in a way exactly opposite to that produced by the gold movements alone: prices in A will tend to fall, and in B to rise, precisely as under paper.

The net result may be a rise of prices in A and a fall in B; or a fall in A and a rise in B; or no change at all. The amount and direction of the change, for example in A, will depend on the relation between the proportion that the new gold bears to the media of payment already circulating, and the proportion that the new increment of commodities bears to the commodities already in process of exchange. If the former is larger, prices will rise; if the latter is larger, prices will fall; and if the two are substantially the same no change will take place at all. And the same type of argument applies to B. In other words the theory of the price changes appearing under inconvertible paper is *not* inconsistent with that of the changes under gold; the former is simply a special case of the general theory that works itself out more fully under gold.

In this connection see the paper by Professor Taussig, already referred to, in the Quarterly Journal of Economics for May, 1917.

2. Logically, of course, A's import prices might remain unchanged if B's export prices fell by the full amount of the shift in exchange rates, and vice versa, but a compromise result is more probable: one set of prices will fall a little, and the other not so far as it otherwise might. It must be remembered, of course, that the exchange rate is not determined even ultimately by import and export commodity *prices* alone, but by total money values.

dustries will not fall, and may rise (from the probable rise in export prices and from the ultimate operation of decreasing costs), while for the opposite reasons money incomes in B's export industries will not rise, and may fall.

The foregoing discussion has traced the chain of consequences following on a change originating primarily in the international trade situation. The requirements of logical completeness also demand an examination of the chain of consequences produced by a change originating in the "domestic" situation as distinct from the purely "international." Such a change would be represented, for example, by a rise in the general price level in A due to monetary causes alone, and not accompanied by an original change in either A's or B's supply or demand schedule for foreign trade commodities. The mechanism of the consequent effects, however, does not differ in its component elements from that which we have already outlined, and any very detailed or accurately qualified discussion would simply involve a repetition of the argument above. The probable results of its operation can be indicated very briefly.

Granted a rise of relative importance and permanence in the general level of A's prices, the accompanying rise in A's export and import prices [3] will reduce the volume of commodity exports, increase that of imports, and through the effects on the total money values of media of payment produce (with the necessary allowance for "lags," which now operate *from* commodities *to* media of payment) a marked initial movement of the exchange rates against A. This movement in turn, through the mechanism already examined, will result in still higher

---

3. The question of the relationships between domestic and international commodity prices is discussed below. Here, without examining the mechanism of the process, it is arbitrarily assumed that the rise in purely domestic prices has eventually caused a similar movement in the international prices of the given country.

import prices in A (higher by the initial rise, plus the rise due to the adverse movement of the exchanges), and in higher export prices; while in B export and import prices will stay the same or fall. These conditions will, however, through their effects on the demand and supply schedules in the two countries, tend to increase the volume of A's commodity exports and decrease that of its imports, relative to the initial changes in those volumes. The exchange rate, in comparison to its earlier movement, will now swing back somewhat in A's favor, and this swing will set up a new chain of effects, of somewhat smaller quantitative importance than the preceding one. As far as this cause of disturbance alone goes, then, there will follow a diminishing spiral of such alternate movements and repercussions, which we need not trace in detail, with the net result that, taking the exchange rate fluctuations as a whole, the level of the rates will have moved permanently against A. And, again without repeating the argument of the preceding pages, it further appears that as a result of this change A will lose, while B will gain: a result opposite to that produced by the disturbance previously considered. Prices in general in A, and especially import prices, have risen,[4] while money incomes will lag behind or entirely fail to reflect the change in commodity prices. Moreover, export industries will be in some measure discouraged. In B the opposite conditions will prevail.

The question of the general relationships prevailing under inconvertible paper between export, import, and domestic prices is not capable of any very definite answer. The earlier discussion has shown, incidental to the examination of other matters, not only that export

---

4. The increase in the volume of commodity imports relative to exports would, taken alone, cause prices to fall, but the quantitative importance of this influence in the general price situation will be offset by the more than proportionate increase in commodity import prices — proportionate, that is, to the increase in the quantity of commodities themselves.

and import prices within any given country can and will move for considerable periods in different directions, but also that such movements may arise quite independently of the situation in the markets for purely domestic commodities. And no force originating in the field of purely international trade was discovered which would of itself restore any given previous relationship between the three groups of prices. In a dynamic state of trade this constant change is inevitable. The underlying conditions that determine domestic as well as international trade, and that govern the direction of the investment of a given country's capital and labor, are themselves continually changing, and the various sorts of prices in which they find expression must necessarily alter their relationships in correspondingly unpredictable fashion. Nor is this situation peculiar to the conditions of trade under inconvertible paper. It is equally true of countries whereof the monetary systems are based upon gold. Only this can be said: if the terms of the trade between two countries are such as to make the production and exchange of international commodities either a distinctly more profitable or a distinctly less profitable field than purely domestic investment, the result will under competition tend always to be a shifting of labor and capital into the more favored field. Money incomes received for similar sorts of services (whether it be the services rendered by the recipient himself, or by something he owns) will tend always to approach equality, tho haltingly and only after an unpredictable lapse of time. But the proximate agency in this process is of course the price mechanism, and in this sense the three groups of prices may be said to move, or to tend to move, in harmony.

There seems to be some reason, also, for thinking that import prices are somewhat more sensitive than export

prices: that they will react more quickly to changes in general conditions, whether these changes be domestic or international. First, they are one step nearer the consumer in the distributive mechanism. Second, they must be proximately determined with direct reference (from the importer's point of view) to market conditions within the importing country, whereas export prices are determined in the first instance abroad, and the exporter may be able to pass on any given disturbance, for a time at least, to foreign import markets. Third, the effects of speculation in discounting future price changes, and in bringing the prices of international and domestic commodities into harmony, are probably felt primarily in the field of import rather than of export prices, since the prices of goods that will *enter* the given country are of greater immediate importance in the general domestic price situation than the prices that will be received for goods *leaving* that country (for export prices are of immediate concern only to the given producers involved; import prices, to all domestic sellers and buyers of the commodity). Finally, since the general terms and conditions of production can be changed only with relative slowness, import prices probably tend to be established, in the first instance at least, with reference to the corresponding export prices in the *other* country. A decrease in the (schedule) demand of either country for imports, for example, would presumably at first merely cut down the volume of export production in the other country, without necessarily affecting prices either there or in the importing country. Only after some time would it result in a substantial reduction of prices and in the driving of labor and capital out of the export industries involved.[5] This whole argument may be open to

5. The possible "lag" here considered is, of course, not to be confused with the lag examined earlier in the paper in connection with the export and import prices of a particular shipment of goods; a lag which arises only in the proximate, short-time mechanism of exchange, and which operates in the opposite direction.

question, and is advanced simply for what it is worth. It may be added, however, that insofar as it has validity the exchange rate would appear to move, in any given case of disturbance, with export prices as the proximate base or pivot: that is, it will tend to produce its principal *initial* effects on *import* prices.

Finally, apart from questions of detailed mechanism, it is obvious that the character of the general relationship between international and domestic prices will depend in part on the relative importance of international trade in the economic life of the given country. Where that importance is slight, the international prices of the country concerned will be primarily resultants, and changes in them will tend to follow, rather than to cause, changes in the domestic situation. Where it is great, as in England at the present day, international phenomena may themselves be a significant and even a dominant factor in conditions which are primarily domestic. Changes in the volume of international trade may affect purely domestic prices materially, through changes in the proportion of commodities in the given country to the quantity of money; and, of perhaps greater actual importance, changes in the volume of the media of international payment may change the level of the discount rates, and thus produce a marked effect upon the conduct of purely domestic commerce and industry, with a corresponding effect on domestic prices.

Closely related to this question of prices, and probably an integral part of the general connection between international and domestic trade, is the question of the phenomena of the business cycle. No attempt has been made to introduce the business cycle into the earlier discussion, and too little is as yet known about its nature and its operation to permit the drawing of general conclusions based upon its existence, but we may at least

suggest one or two modifications which a full recognition of it would necessitate in the previous analysis. First, the operation of the short-time mechanism examined in the second section of this paper might well be appreciably altered, at least with regard to the nature of its quantitative results, by the position of the given country in the business cycle. If, for example, the country were in a period of general depression and contraction, a lowering of commodity import prices following a favorable movement of the exchanges would not necessarily result in increased purchases by importers, and certainly not in so great an increase as would appear in a period of rising prices; and a period of acute depression might virtually suspend the operation of the international trade mechanism. If viewed in this light, the previous analysis of that mechanism must be regarded as based primarily on "average" or "normal" conditions.

Second, the passage of the country through the business cycle will *of itself* change the levels of commodity prices in general, alter exchange market conditions through the effect on the discount rate, affect the desire and the ability of dealers and producers to engage in commerce, and thus change the terms at which the given country can trade — quite apart from any necessary change in the general character and direction of its industry and commerce. Should the cycles in the countries involved proceed at different times and rates, wide fluctuations in the exchanges might follow from these differentials alone. Finally, the cycle will obviously affect the terms and amounts of international borrowing. On the other hand, its effects will be felt primarily in the field of raw materials and unfinished goods, especially those entering the more important industries, and only in much smaller degree in the field of what may be called consumers' goods. But it is at most possible here

to indicate some of the questions which the relation of the business cycle to international trade suggests.

The last problem to be considered is that of the long-run nature of the so-called par of exchange under inconvertible paper, a problem which has been reserved until this point because it seems to be most open to debate, and also because it is not a necessary and integral part of our general argument. In the "short-time" period the paper par of exchange, or "zone of parity," was found to be created by and dependent on the existence, admittedly temporary at best, of substantial stability in those underlying conditions which ultimately govern the terms and the course of international trade. But in the long run these determinant conditions will of course change materially and unpredictably, and in changing must destroy the particular parity based on their previous stability. Either one of two views concerning the character of this change is tenable. It can be regarded as absolutely continuous, in which case there will be no possibility of the appearance of a true parity, however brief the time period of which it is predicated; or it can be regarded as proceeding in a series of stages, as alternating periods of marked general variation with periods of comparative quiescence, during which specific changes in one direction are substantially offset by specific changes in the other.

The latter view seems to me to be more in accord with what is known of the general character of business activity, and with general economic reasoning. In the long run the exchange rate may be regarded as being simply an expression, through the medium of the various kinds of prices, of the relationships and interactions between the underlying economic conditions of the one country and the other.[6] If these conditions change the

---

6. The exchange rate actually prevailing in the market is fundamentally, of course, a product of two main sets of forces, not simply of one; first, of the interactions as between

rate will change, in the absence of a corrective device like the gold parity; if they remain comparatively stable or "static" for a time it also will tend, barring monetary disturbances, to remain stable, and to give expression to that temporary stability in the form of a true par of exchange — a parity, it may again be observed, which is derived empirically, and which emerges simply as that point or zone to which the rates, during the continuation of underlying stability, tend to return. In other words, altho over a period of years no one such parity can be maintained under paper, nevertheless a discrete series of short-run parities will tend to appear, none of them being necessarily the same as any other. But the point need not be pressed further.

This paper has been chiefly concerned with the mechanisms and processes which may be presumed to appear in international trade under a paper régime. To simplify the analysis as far as possible certain assumptions were made, and adhered to throughout the discussion. Two countries only were considered; fairly effective competition in and between these countries was postulated; and the problem of monetary disturbances was ruled out by assuming the quantities of money within each country to be fixed. In addition the factor of "invisible items" was as far as possible eliminated. The qualifications to the conclusions here reached which these assumptions make necessary would now be appropriate, but this task

countries of the underlying economic conditions in each; and second, of the monetary situation within each country. This second set of forces has been ruled out of our whole discussion, or made at most a negative translating agency, by the original assumption of a fixed quantity of money in each country. Any attempt to define the ultimate character and function of the exchange rate in more specific terms (such as those suggested by a long-run application of Cassel's purchasing-power-parity doctrine) must of necessity be open to serious question. The relation of the rate to the complex and constantly shifting forces which fundamentally determine it is hardly capable of being definitely formulated. All that can be said is that, in the ultimate sense, the rate tends to express the results of the interaction of these forces in and between the countries involved, and to hold them, through pecuniary mechanisms, in some sort of aggregated balance — a balance, as has already been indicated, in which the terms are rarely at rest.

may be left to the reader: the primary concern here has been the composition and operation of the various mechanisms, rather than the quantitative nature of their results. Nor has any systematic effort been made to point out the differences and the analogies between the mechanisms existing under paper and those existing under the gold standard, illuminating tho these be: limitations of space, as well as the danger of obscuring the course of the argument, forbade. Finally, the lack of adequate data has prevented any attempt at a correlation, however superficial, of the tentative results here obtained with the conditions of international trade in Europe during and immediately after the war, when many countries were in effect if not avowedly on a paper basis. Nevertheless the material for the proof or disproof of these results will to a large extent be found in the economic incidents of the war period, and it is perhaps permissible to hope that the conclusions here reached will prove to contain an explanation of at least a part of the extraordinary disturbances in foreign trade witnessed since 1914. Those disturbances clearly indicate the desirability of an inductive investigation along lines that may well be new, and that may demonstrate, as a corollary, the need of an amplification of certain parts of the older theory.

JAMES WATERHOUSE ANGELL.

HARVARD UNIVERSITY.